Method and apparatus for applying a plastic edge strip to a plate-like workpiece and such a workpiece

TECHNICAL BACKGROUND

This invention relates to an apparatus for applying a plastic edge strip to a plate-like workpiece, a method of applying the edge strip to the workpiece, and a plate-like workpiece which has had the edge strip applied thereto by means of the apparatus or by the method. The workpiece may be a wooden board, a chip or particle board, or a board of wood-like particles.

DESCRIPTION OF THE INVENTION

According to the invention there is provided an apparatus for applying a plastic edge strip on an edge of a plate-like workpiece, which includes extrusion means for extruding a strand of plastic material on an edge of the workpiece; and forming means for forming the extruded strand of plastic material in a desired shape or profile.

Further according to the invention there is provided a method of applying a plastic edge strip on an edge of a plate-like workpiece, which comprises extruding a strand of plastic material on an edge of the workpiece; and forming the extruded strand of plastic material in a desired shape.

As indicated above the workpiece may be a wooden board, a chip or particle board, or a board of wood-like particles and the like.

In one embodiment, the workpiece may be transported past the extrusion means and the apparatus may further comprise

transporting means for transporting the workpiece past the extrusion means. In an alternative embodiment, the workpiece may be stationary and the extrusion means and forming means are transported along the edge to which the strip is to be applied, and the apparatus may have a movable arm on which the extrusion means and forming means are carried.

The forming means may include at least one rotatable wheel-like or roller-like component having forming formations at its rim. For convenience, such a forming component is hereinafter referred to as a "roller". It will thus be appreciated by those skilled in the art that the forming roller may have a recessed rim in which the forming formations are located. Thus, the roller will have a circumferential profile substantially corresponding with the desired profile of the strand of plastic material applied on the edge of the workpiece.

The forming means may comprise several rotatable rollers arranged successively, with different circumferential profiles such that the rollers together deform the strand of of plastic material into the desired profile.

Alternatively, the forming means may include a doctor blade or a kind of forming shoe.

The invention extends still further to a workpiece which has had a plastic edge strip applied thereto by means of the apparatus or by the method of the invention.

The plastic may be a thermoplastic material and may, for example, be PVC, polystyrene, polyurethane or any other suitable thermoplastic synthetic plastics material. Plastic in sense of the present application may include any other formable mass which hardens after a predetermined time period.

It will be appreciated that the profile of the extruded strand of plastic material is, to a large extent, irrelevant,

and the desired shape or profile and profile is provided by the extruded strand being squeezed between the forming roller and the edge of the workpiece. The shape and profile of the formed edge strip is not determined by the head or aperture of the extrusion means.

The forming roller may include projections and recesses to provide the surface of the rolled, profiled strip with ornamentation or a pattern as well as the profile.

The extruded strand may be extruded onto the edge of the workpiece, the strand then being squeezed between the edge and the forming roller.

The edge of the workpiece onto which the formed strip is to be bonded may be coated with a suitable adhesive or bonding layer. The apparatus may thus have an adhesive applicator.

Persons skilled in the art will be aware that an adhesive layer could be applied to the edge of the workpiece in a prior operation and the adhesive is then activated, by heat or in any other suitable way depending on the nature of the adhesive, immediately before the extruded strand is applied to the edge.

The forming roller may be freely rotatable or it may be driven.

A surface ornamental layer may also be applied onto an outer surface of the formed strip. Conveniently, such an ornamental layer may be provided by a foil which is passed between the strip and the forming roller. The foil may be applied onto a part of the formed strip or across the entire surface of the formed strip. The foil may be carried on a carrier which is removed downstream of the forming roller.

It will further be appreciated by those skilled in the art that the cross sectional area of the extruded strand of plastic material may be substantially the same as that of the formed strip. However, the extruded strand may have slightly more material than that of the desired profile, so that there is a small ribbon on either side of the formed strip. The apparatus may then have a stripping station to remove the ribbons.

The apparatus may have a support structure for supporting the workpiece whilst the edge strip is applied thereto. The support structure may support the workpiece in a generally horizontal or vertical orientation such that the edge is either vertically or horizontally oriented. If the edge is vertically oriented, the forming roller will be rotatable about a vertical axis whereas it will be rotatable about a horizontal axis if the edge is horizontally oriented.

A transporting means may also be provided for transporting the workpiece relatively to the forming roller and an extrusion head of the extrusion means. As indicated above, the transporting means may displace the workpiece or the extrusion means and forming means. Conveniently, the extrusion head and forming roller remain in position whilst the workpiece is transported relative thereto. It will be appreciated that the workpiece will be transported linearly if the edge is straight, or along a curved path if the edge is curved. Such a transporting means may transport the support structure itself or the workpiece.

Instead, of the workpiece being transported by the transporting means, the workpiece may be freely displaceable on the support structure and may be transported by the forming roller, there being suitable frictional engagement between the forming roller and the workpiece, and the forming roller being driven by a motor.

The workpiece may be transported at the same speed as the circumferential speed of the forming roller.

A pressure means may also be provided to urge the edge of the workpiece against the forming roller. This may be facilitated by pressure wheels that are spaced from the forming roller a distance equal to the width of the workpiece and are rotatable about parallel axes.

A guide wheel may also be provided between the forming roller and the extrusion head for guiding the feedstock strand between the edge of the workpiece and the forming roller.

A cooling station may also be provided downstream of the forming roller.

The edge of the workpiece may have a suitable profile.

A machine according to the invention may also include a pre-processing means for forming the edge of the workpiece in a desired profile, for example by milling.

Those skilled in the art will further understand that the board may have any length and width dimensions and the term "board" includes a "plank".

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The invention is now described, by way of an example with reference to the accompanying drawings, in which:

Figure 1 shows schematically a plan view of a first embodiment of an apparatus in accordance with the invention for applying a plastic edge strip to a wooden board;

Figure 2 shows schematically a side view of a roller forming part of the apparatus of Figure 1 and how the edge of the board and a feedstock strand interact therewith; and

Figure 3 shows schematically a plan view of a second embodiment of an apparatus in accordance with the invention for applying a plastic edge strip to a wooden board.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Referring to Figure 1, an apparatus for applying a plastic edge strip 12 to an edge 14 of a wooden board 16 is designated generally by reference numeral 10. The apparatus 10 has an extruder 18 which provides an extruded strand 20 that has a circular cross section as is more clearly shown in Figure 2. The extruded strand 20 is of soft PVC.

Immediately downstream of the extruder 18 and close enough that the extruded strand 20 does not cool much and remains sufficiently hot to be moulded, there is a moulding station 22.

The moulding station 22 has a roller 24. The roller 24 has a concave rim 26 as is seen more clearly in Figure 2. As will be appreciated from what is said below, the concave rim 26 defines a moulding cavity together with the edge 14. Thus, the circumference of the roller 24 is profiled to mould the extruded strand 20 to have the desired profile. As seen in Figure 2 the extruded strand 20 is moulded onto the edge 14 of the board 16 into the formed edge strip 12 which follows the profile and contour of the edge 14 of the board 16 and is securely adhered thereto.

As is seen in Figure 2, the concave rim 26 is complementarily shaped to the edge 14 of the board 16.

It will further be appreciated that the roller 24 has fairly sharp sides 30 and the roller 24 and the edge 14 are spaced so that there is a gap of about 0,5 mm between the borders of the edge 14 and the sides 30.

A guide wheel 32 is positioned between the extruder 18 and the roller 24 to guide the strand 20 between the roller 24 and the edge 14.

The board 16 is supported in a horizontally extending manner on support rollers (not shown) with the edge 14 extending vertically. Pressure wheels 34, which are rotatable about vertical axes urge the edge 14 of the board 16 against the roller 24. The pressure wheels 34 are mounted in an adjustable manner on a bar 44 so that the spacing between them and the roller 24 is variable. The roller 24 is also rotatable about a vertical axis that is parallel to the axes of the pressure wheels 34. A feed wheel 36 engages the upper surface of the board 16 to drive it in the direction of arrows 38 so that the edge 14 moves linearly past the roller 24. The roller 24 may be rotated by engagement with the edge 14 or may be driven at the same circumferential speed as the board 16.

Thus, the edge 14 and the roller 24 define between them a progressive moulding cavity as the roller 24 rotates and the edge 14 moves past it. The extruded strand 20 is fed onto the edge 14 to be moulded into the formed strip 12 by the progressive moulding cavity.

It will be appreciated further that the extruded strand 20 is drawn between the roller 24 and the edge 14 and is squeezed to have the desired profile as the roller 24 rotates.

It will be understood that the progressive moulding cavity has a cross sectional area and the extruded strand 20 has a slightly larger cross sectional area so that there is

sufficient material to fill the progressive moulding cavity and have a small excess. This small excess is then squeezed out between the roller 24 and the edge 14 to provide side ribbons 40. These are easily trimmed off and removed by a stripping station (not shown).

The formed strip 12 is bonded to the edge 14, bonding being improved by an adhesive applied by an applicator 42. The adhesive is a heat activated, solvent based polyurethane such as that supplied by Genkem, under licence from Helmilin Werke, with code VAW 595.

The formed strip 12 travels past a cooling device 46 which uses either air or water to cool the formed strip 12.

A woodgrain ornamental foil 48 is supplied from a coil 50 next to the roller 24 between the extruded strand 20 and the roller 24. The foil 48 is bonded by heat and pressure as it passes under the roller 24 onto the outer surface of the formed strip 12.

Figure 3 is now referred to. Shown therein by reference numeral 51 is a second embodiment of an apparatus for applying a plastic edge strip to an edge of a wooden board. The components of apparatus 51 that are similar to that of the apparatus 10 have the same reference numbers.

With the apparatus 51, the wooden board 16 is stationary and the extruder 18, the moulding rollers 24.1 and 24.2 and the cooling device 46 travel. Thus, the board 16 is supported on beams 52 and is clamped thereto by a clamp 54. The beams 52 also support rails 56. A carriage 58 is movably supported on the rails 56 by wheels 60. The carriage 58 is moved up and down the rails 56 by a suitable transport mechanism (not shown). The board 16 is clamped on the beams 52 with the edge 14 parallel to the rails 56 and the appropriate distance therefrom. Thus, as the carriage 58 is transported from one

end to the other, the strip 20 is applied to the edge 14, is moulded by the rollers 24.1 and 24.2 to have the desired shape and profile and the formed strip 12 is cooled by the cooling device 46. The two rollers 24.1 and 24.2 progressively mould the extruded strip.

By means of the invention an edge strip is securely bonded to the edge of a wooden board, which may be fibre or chip board, in an efficient, economical and effective manner. The edge strip may also be provided with any suitable profile, pattern and ornamentation.